Dermal Burn During Hip Arthroscopy

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abstract

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Radiofrequency devices are often used during arthroscopic surgery, most commonly of the shoulder and knee, and increasingly in hip arthroscopy. The most commonly described complication is elevation of joint temperature, leading to capsular shrinkage, chondrolysis, and nerve damage. A less commonly reported complication is that of dermal burns from the heated irrigation fluid. There are several case reports describing dermal burns after shoulder arthroscopy; however, to the authors’ knowledge, there are none describing the complication in hip arthroscopy that is often performed by surgeons doing limited if any shoulder arthroscopy. The authors report this case to raise awareness that the use of radiofrequency devices can also lead to extraarticular complications because of the effect of elevated irrigant fluid temperatures on the patient’s skin. Sufficiently high temperatures were generated inside the joint, causing a superficial second-degree burn from the outflow irrigant. In the course of instrument switching from sucker/shaver to radiofrequency wand, the outflow valve was inadvertently left open with no attached suction while the radiofrequency wand was in use. Most second-degree burns like the one reported require only conservative therapy with cool compresses to decrease the temperature of the wound. The authors did recommend bacitracin ointment to prevent superficial wound infection, however unlikely with no disruption of the skin. The authors continue to use radiofrequency devices in hip arthroscopy, but are vigilant to maintain dedicated suction at the outflow tubing throughout the procedure. Surgeons should take strict precautions to avoid this preventable complication and follow all manufacturer instructions on the use of such devices.

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Radiofrequency devices are commonly used during arthroscopic surgery, typically of the shoulder and knee, and increasingly in hip arthroscopy. The most commonly reported complication is elevation of joint temperature, leading to capsular shrinkage, chondrolysis, and nerve damage. A less commonly reported complication is dermal burns from the heated irrigation fluid. The authors present this case to raise awareness that the use of radiofrequency devices can also lead to extra-articular complications because of the effect of elevated irrigant fluid temperatures on the patient’s skin.

The authors continue to use radiofrequency devices in hip arthroscopy, but are vigilant to maintain dedicated suction at the outflow tubing throughout the procedure. Surgeons should take strict precautions to avoid this preventable complication and should follow all manufacturer instructions on the use of radiofrequency devices.

**Case Report**

A healthy 29-year-old woman presented with an 8-month history of right hip pain after training for a marathon. Examination of the right lower extremity showed no leg length discrepancy or appreciable pelvic obliquity. She had a positive hip impingement sign on physical examination. Pain was not reproduced with abduction of the hip, nor was there tenderness to palpation over the trochanteric bursa. The skin was intact, without abrasions or lacerations. Plain radiographs of the hip showed no evidence of joint space narrowing, Cam lesion of the femoral neck, or acetabular retroversion (Figure 1). Magnetic resonance arthrogram of the right hip showed an anterior superior labral tear as well as a loose body within the joint (Figure 2). The patient had immediate pain relief with the local anesthetic used during the arthrogram.

After discussion of the risks and benefits, the patient elected to proceed with hip arthroscopy with repair of the torn labrum. At the time of surgery, the patient was placed supine on a HANA orthopedic fracture distraction table (Mizuho Orthopedic Systems Inc, Union City, California). The right hip was prepared and draped in standard sterile surgical fashion. Lateral and anterolateral portals were made under fluoroscopic visualization. On entering the joint, a large fragment of debris was found floating within the joint, with minimal attachment to the superior acetabular rim. Once this fragment was debrided to allow visualization of the joint, a very frayed peripheral labral tear was observed. The tear did not appear to be repairable and was therefore debrided with a radiofrequency wand (TurboVac, ArthroCare, Sunnyvale, California) and a 5.0-mm aggressive sucker/shaver. A region of cartilage delamination was noted that measured approximately 1×0.5 cm in the border of regions 2 and 3. Chondroplasty and microfracture of that region were performed to stimulate healing. On taking the hip through a range of motion, there was no evidence of impingement. However, in the flexed and internally rotated position, it appeared that the previously seen labral tear was in the area that would have caused pain. There was no evidence of Cam lesion of the femoral head and neck junction. The portal sites were closed with a subcuticular suture and dermal glue, followed by small island dressings. The patient tolerated the procedure without complications and was discharged home the same day.

Three days later, the patient contacted the senior author (B.C.) by telephone and e-mailed a photograph of an erythematous and tender area between the 2 portal sites (Figure 3). The patient had originally noticed erythema and tenderness just before leaving the hospital on the day of surgery. She initially had little concern. However, redness worsened over the next 3 days. The case was informally discussed with a plastic surgery colleague who recognized this as a dermal burn and recommended a topical antibiotic ointment. At
this point, the patient was given instructions for wound care to include daily application of bacitracin ointment and offered an appointment for evaluation if symptoms did not improve or worsened. She did not contact the office because of further concerns and was next seen at the routine 3-week postoperative visit. At that time, the burn was healing well, and it was much improved at 6 weeks (Figure 4). The hip symptoms have since completely resolved, and the patient has resumed normal activities without pain.

**DISCUSSION**

The use of radiofrequency devices is becoming very common in orthopedic arthroscopic procedures. Benefits include precision in removing tissue while maintaining hemostasis and a clear arthroscopic field of view. As with many surgical devices, there are reported risks and complications associated with their use. Prolonged use of these devices inside a joint can greatly influence fluid temperature, depending on the volume of joint fluid, length of radiofrequency device use, and flow rate of the irrigant solution. Numerous reports in the literature have focused on the effects of elevated joint fluid temperatures on articular cartilage. Horstman and McLaughlin noted capsular tissue changes at temperatures above 65°C and chondrocyte damage at temperatures as low as 45°C. Zoric et al. found that in a cadaver shoulder model joint fluid temperatures could increase to 80°C in a no-flow setting after only 2 minutes. Previous studies have also shown that under no-flow conditions intermittent treatment with a radiofrequency probe can cause joint fluid temperatures to exceed 50°C after 70 seconds. With continuous radiofrequency probe treatment, chamber fluid temperatures can exceed 65°C after 2 minutes of treatment, and the highest mean recorded chamber fluid temperature reached 80°C at 3 minutes.

Although these temperatures can have significant effects on intra-articular structures, effluent irrigation must not be disregarded. If not connected to suction or clamped securely at all times, the outflow tubing may allow the heated effluent to flow over the skin. Studies have shown third-degree burns to occur in as little as 2 seconds at 65°C, 15 seconds at 56.1°C, and 5 minutes at 50°C. All of these are attainable temperatures in the course of hip arthroscopy with improper venting or prolonged use of a radiofrequency device. Several case reports in the shoulder literature have reported second-degree dermal burns after arthroscopy because of skin contact with effluent. Described burns were 0.5-inch linear streaks oriented according to gravity in the lateral decubitus position. None originated from an arthroscopic portal. These burns were directly linked to improperly vented radiofrequency devices, with leakage of warmed effluent directly onto the skin.

In the current case, sufficiently high temperatures were generated inside the joint to cause a superficial second-degree burn from the outflow irrigant. In the course of instrument switching from sucker/shaver to radiofrequency wand, the outflow valve was inadvertently left open with no attached suction while the radiofrequency wand was in use. It is also possible for effluent to leak from the portal itself; however, in this case, the burn did not appear to begin immediately adjacent to the portal site. The apparent leading edge of the burn started almost 2 cm from the portal, suggesting that the effluent was from the outflow valve. In addition, the Ioban drape (3M, St. Paul, Minnesota) provided little if any additional protection against the heated effluent and also may have inadvertently disguised the burn until after the procedure was completed. On removal of the drape, redness or irritation that was observed but unnoted simply may have been attributed to typical skin irritation caused by the drape adhesive. In the current case, fortunately, the patient had only a partial-thickness burn and will heal without a scar.

As in the current case, most second-degree burns require only conservative therapy with cool compresses to decrease the temperature of the wound. The authors recommended bacitracin ointment to prevent superficial wound infection, but infection was unlikely if no disruption of the skin occurred. Had blistering been present, more detailed examination of the burn may have been warranted, along with likely treatment with burn-specific ointments, such as silver sulfadiazine.

The authors present this case to raise awareness that the use of radiofrequency...
devices is not without risks and complications. It is important to be aware of the effect of elevated irrigant fluid temperatures on the intra-articular structures and the patient’s skin. Also of note is the increased vulnerability of skin after preparation with alcohol-based solutions.

The authors continue to use radiofrequency devices in hip arthroscopy, but are vigilant to maintain dedicated suction at the outflow tubing throughout the procedure. Surgeons should take strict precautions to avoid this preventable complication and should follow all manufacturer instructions for the use of radiofrequency devices.

REFERENCES


